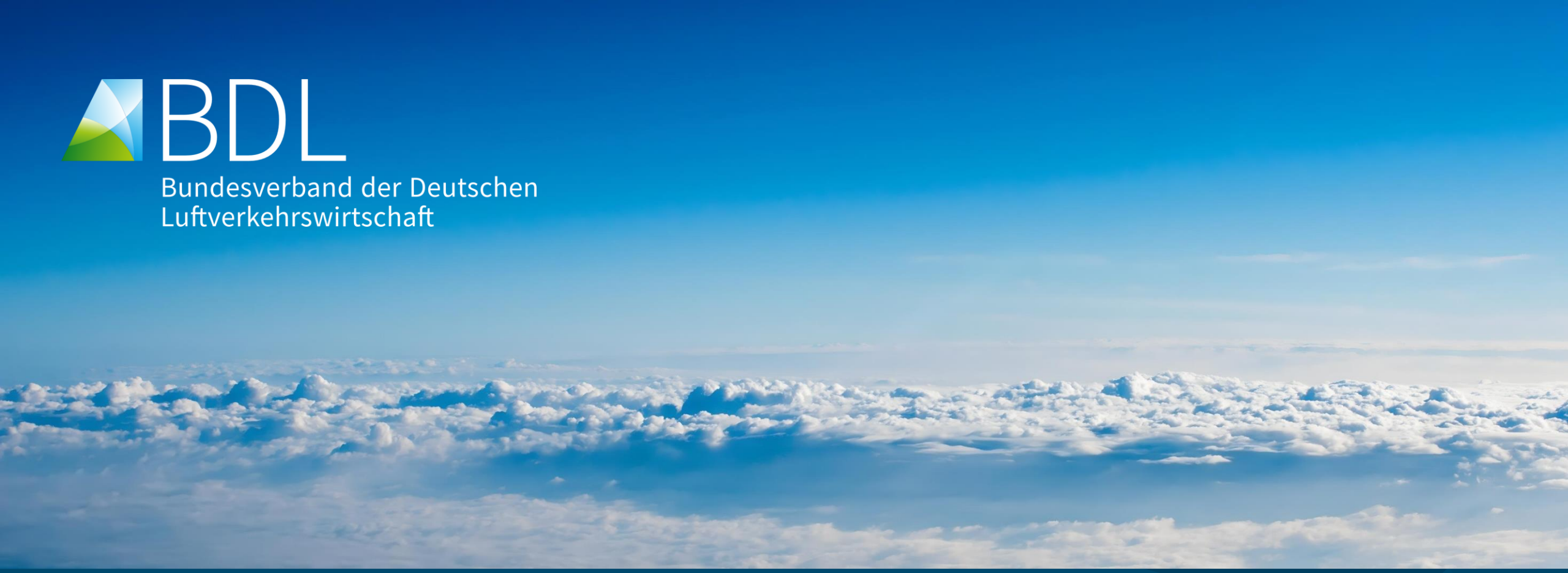

BDL
Bundesverband der Deutschen Luftverkehrswirtschaft

AUTOMATION ON THE APRON

Büttelborn, 14.11.2024

BDL

AGENDA

1. Introduction German Aviation Association (BDL)
2. Automation Introduction into subject
3. Autonomous driving
4. Remote towbarless pushback
5. Remote passenger bridge
6. Baggage robotics

1. German Aviation Association (BDL)

GERMAN AVIATION ASSOCIATION (BDL)

The German Aviation Association **consolidates, represents, and promotes the interests of its members to the government, media, and public. German airlines, airports, Deutsche Flugsicherung (air traffic control), ground handling service providers and retail companies are organized within the BDL. The association is open to all German aviation companies and associations.**

The German Aviation Association was founded on December 9, 2010, and is located in Berlin-Mitte.

At the head office the team consisting of 16 persons supports the board in implementing the goals decided by the Steering Committee.

The Steering Committee consists of the President of the BDL and other representatives from the member companies.

2. Automation

Introduction into subject

INTRODUCTION INTO SUBJECT

Challenges

- Turnaround times decrease at the same time passenger figures growing as well as aircraft movements continuously
- Personnel resources are not available to the same degree
- Digital development particularly at landside
- Less change in aircraft handling

INTRODUCTION INTO SUBJECT

Why is Automation the key

- Automation increases velocity
- Automation improves reliability and stability of the process
- Automation reduces physical stress for the loading people
- Automation enhances customer satisfaction

INTRODUCTION INTO SUBJECT

Initialisation of working group

- Participants

- Airlines; Lufthansa, Lufthansa Cargo, Condor, Tuifly
- Airports; BER, FRA, MUC, STR
- Certification organisations; DEKRA, TÜV
- German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication
- Further institutions if necessary; Insurance Companies etc.

INTRODUCTION INTO SUBJECT

Field of application

AUTONOMOUS DRIVING

- Baggage
- Passengers
- Passenger Bridges (Jetways)
- Winter Operation

REMOTE CONTROLS

- Passenger Bridges (Jetways)
- Push back tugs

BAGGAGE ROBOTICS

- Drawdown of trollies / ULDs
- Lift facilities
- Loading / Unlading in sorting areas

3. Autonomous driving

AUTONOMOUS DRIVING

EXAMPLES OF AUTONOMOUS VEHICLES

Reference: Picture EasyMile

TLD/EasyMile EZTow

GNSS, Lidar, camera, odometry, inertial measurement unit

Safety Lidars, safety ECU, emergency stops, audio and visual signals

4G connection to EasyMile Cloud infrastructure

Rear panel screen with buttons (outside), 7'' Touchscreen (inside the cabin), Fleet Management Control Center (remote)

Reference: Picture Charlatte

Charlatte Autonom Tract ATI35

GNSS, Lidar, cameras, odometry, inertial measurement unit

NAVYADRIVE System

Fleet monitoring

Reference: Picture Toyota

Toyota Autonomous Towing Tractor

No data applicable

EXAMPLES OF AUTONOMOUS VEHICLES

Reference: Picture Aurrigo

AURRIGO Auto-DollyTug

Part of the Digital Testbed Air Cargo (DTAC) was tested in STR

The dolly can transport 1 ULD and can tow addtionally three dollies with ULDs

Reference: Picture KLM/AMS

Selfdriving shuttle service KLM/AMS

Sensors, special cameras, GPS, and LIDAR technology for a 360-degree view

Reference: Picture SATS

SATS Airport Services Pte Ltd & SIA Engineering

EXAMPLES OF AUTONOMOUS VEHICLES

ALEXANDER DENNIS ENVIRO200 SINGLE DECKER

Trial in Edinburgh until 2025

- Distance 22,5 km
- Max. Velocity 80 km/h
- Automated Driving System (ADS) of Fusion Processing
- Supervision by person on driverseat

Reference: Picture Alexander Dennis

4. Remote towbarless pushback

REMOTE TOWBARLESS PUSH BACK

EXAMPLE OF TOWBARLESS PUSH BACK TUG

Power Push Unit (by Schopf was bought by Goldhofer)

- Applicable for A320 and B737 family
- Full electric power
- Remote control, only one person required for operation
- Extreme low hight, no interference with mounted devices
- No driving lisence needed
- Was in use at BRU, CDG and in NRT

EXAMPLE OF TOWBARLESS PUSH BACK TUG

Mototok Spacer

- Applicable for A320 and B737 family
- Full electric power
- Remote control, only one person required for operation
- Extreme low hight, no interference with mounted devices
- No driving lisence needed
- In use at LHR T5, BCN & MAD

5. Remote passenger bridge

REMOTE PASSENGER BRIDGE

AUTONOMOUS / REMOTE PASSENGER BOARDING BRIDGE

Different projects around the world

SIN: ShinMaywa as manufacturer actively working with Changi Airport, Autonomous remote docking and un-docking from base, not in routine Ops – Procedures to be defined with Airline, AI needs to be trained for each Airline/Livery/Aircraft-Type

AMS: Initiative for autonomous docking PBB with manufacturer CIMC and SIOUX-CC, One test installation carried out with KLM A/C, currently in use since 2019 according to Airport, Investment for more PBBs committed

MAD: AENA in cooperation with manufacturer TKE, remote control is installed in PBBs, three remote centers planned for the airport – 5 to 6 working positions per center for 39/43/47 PBBs, test phase to begin March 18th, rollout to be finished by September 2024, no autonomy active – only remote

ZRH: Test remote control only with Swiss A/C, more than 70 pax-flights were handled without any impairments, more than 120 PBB movements were performed from remote control system,

MUC: 6 month trial remote control for one PBB, no real A/C only mock-up in use, no connection to airport interfaces

Reference: Picture Airport Zurich

ALTERNATIVE FOR THE SAFETYSHOE

- Fixed pressure pad
- With heating, integrated wiring and stabile framework

Reference:: Picture Airport Zurich

DOOR OPENING PROCESS

- No touch docking with sensor left and right is applicable
- Acustic and visual device for opening process works

Reference: Picture Airport Zurich

6. Baggage robotics


BAGGAGE ROBOTICS
AAT

BAGGAGE ROBOTICS – BAGGAGE UNLOADING

Reference: Picture Fraport

Suction arm (FRA)

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Reference Picture Airport Schiphol

Bag Kipper (AMS)

BAGGAGE ROBOTICS – BAGGAGE UNLOADING

Reference: Picture Airport Schiphol

Cobot lift (AMS)

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Reference: Picture Airport Schiphol

Easyloader (AMS)

BAGGAGE ROBOTICS – BAGGAGE LOADING SOLUTIONS

Reference: Picture Fraport

Kuka-AAT robot (FRA)

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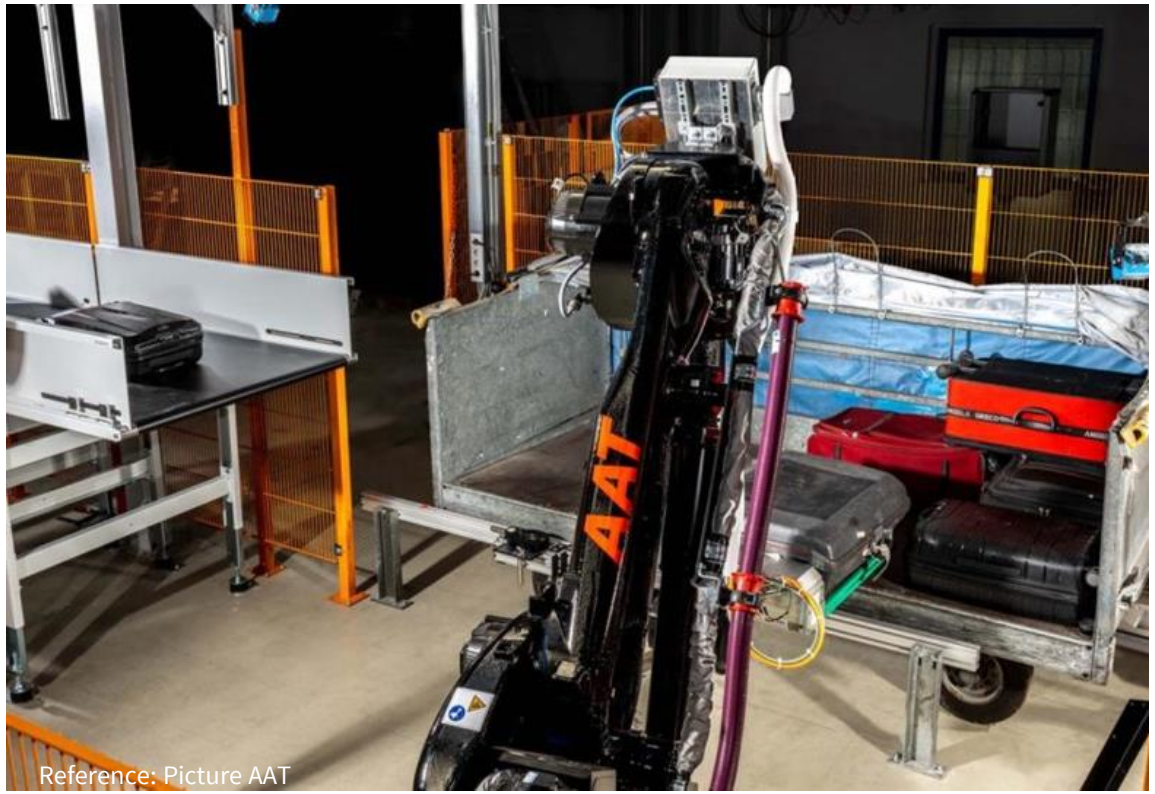
Reference: Picture Airport Schiphol

AAT loading robot (AMS)

BAGGAGE ROBOTICS – BAGGAGE LOADING SOLUTIONS



Reference: Picture AAT

AAT ABLE MK 2

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Reference: Picture AAT

AAT ABLE MK 2

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Thank you!